Idaho Department of Fish and Game

2018

STRATEGY FOR

CHRONIC WASTING DISEASE

PREVENTION, DETECTION, AND MANAGEMENT FOR IDAHO'S WILD CERVIDS (DEER, ELK, AND MOOSE)

BACKGROUND

Chronic Wasting Disease (CWD) is an infectious disease of cervids caused by misfolded proteins (prion) that are transmitted by ingestion of prions from contaminated environmental components or directly from contact with infected animals. The disease has a long incubation period and a long period of prion shedding. The disease is always fatal in cervids and is preceded by prolonged neurological degeneration and dysfunction. A prion is not a bacterium, a virus, or fungi. A prion cannot be treated, or controlled with conventional measures; there is no known cure for an animal suffering from CWD. There are ways to decrease the infectivity of prions, but the environmental treatments are not practical for large-scale use.

Since 1997, the World Health Organization has recommended that all known agents of prion disease be kept from entering the food chain and the U.S. Centers for Disease Control and Prevention (CDC) supports this recommendation (https://www.cdc.gov/prions/cwd/index.html). The CDC states that hunters should have their meat tested for CWD prior to consumption if hunting in a known CWD-positive area, and to avoid consumption of any tissue from CWD-positive animals. Chronic Wasting Disease prions are distributed throughout the organs and tissues of affected animals, with lymphoid tissue, tonsil, and nervous tissues being the most heavily infected. Prions have also been detected in saliva, urine, feces, fat, muscle, kidney, and antler velvet. Advances in testing have allowed for the detection of prions in much smaller amounts, resulting in the ability to detect CWD in samples from seemingly healthy cervids, improving the understanding of how prions spread. The same advancements have also allowed for experimentation in tracing infectivity of saliva, urine, and blood (Haley et al. 2016 and Henderson et al. 2015). Better understanding of which tissue types contain prions, and how an infected animal sheds prions, may assist wildlife managers in proactive prevention and moderating the transmission of the disease. Deer have significantly higher CWD prion levels than elk, suggesting that deer may be more important for transmission of CWD than elk (Race et al. 2007). Understanding the obstacles posed during long incubation periods prior to CWD diagnosis, the geographical locations where an animal may be shedding prions into the environment and which species have a higher likelihood of shedding may change wildlife and habitat management practices.

Chronic Wasting Disease is density and frequency of contact dependent (Storm et al. 2013) with both horizontal (animal-to-animal) transmission and environmental contamination serving as prion pathways. The horizontal spread of CWD has been attributed to both natural and anthropogenic (human caused) factors. The natural factors include the properties of the prion (prolonged incubation, multiple routes of shedding, prolonged periods of shedding, environmental stability) as well as the natural migration patterns of free-ranging deer and elk. High-density winter and summer ranges, with multiple species overlap on these ranges, may increase transmission opportunities for CWD. Dispersal may enhance the spread of CWD to far greater distances than typical migration (Conner and Miller 2004). Anthropogenic factors are the artificial translocation and the congregation of cervids. Examples include long-distance movement and placement in high-fence operations or artificial movement of animals to due to management decisions such as winter feeding, rehabilitation permits, and relocations (Miller and Fischer 2016). Chronic Wasting Disease prions can remain viable on feeding surfaces and on items like the instruments and tools used for sampling or handling of infected animals. Standard

cleaning and disinfecting techniques do not kill the CWD prions. Tools suspected of CWD contamination can be cleaned using an enzymatic or alkaline digestion technique followed by high temperature autoclaving. There are no practical methods or solutions to clean and disinfect animal pens, corrals, soils, or plants. Carcasses require incineration at very high temperatures ($\geq 1{,}800^0$ Fahrenheit) to destroy the prions.

Once CWD prions are on the landscape, it is considered improbable that they will be removed. Prions have been found to have a greater affinity for certain soil types and remain stable for many years under laboratory conditions. Experiments have shown plants can take up prions from the soil and animal waste, leading to infection of grazing animals (Pritzkow et al. 2015). In addition, CWD prions appear to remain infectious in carcasses for ≥ two years (Miller et al. 2004). There is no cure once a cervid is infected and no treatment available; prevention is the best option for protecting the long-term health of Idaho's cervids.

Multiple studies have shown that heavily infected cervid populations do not thrive in the long term (Almberg et al. 2011, Monello et al. 2014, Williams et al. 2014). A study in Wyoming focusing on a local population of mule deer estimated a 21% annual decline and extinction within 40 years due to high CWD prevalence (24%), (DeVivo et al. 2017). A similar Wyoming study of white-tailed deer with high CWD prevalence (33%), estimated extinction in 48 years at the current level of mortality and fecundity (Edmunds et al. 2016).

While strides have been made in understanding CWD, there is still incomplete knowledge on how best to manage the disease. The persistence of prions in the environment and the inability to restrict animal movement limit feasible management options. Management approaches in other states have not resulted in the eradication of CWD. In the two exceptions, New York and Minnesota, a quick response to low prevalence and small geographic distribution of CWD-positive animals resulted in containment and eradication to date. Other states typically found an expanding geographic distribution and increasing prevalence despite management actions (Miller and Fischer 2016, Uehlinger et al. 2016). A recent review of CWD management practices concluded most actions were too little, too late, too restricted, too passive, or of insufficient duration to be successful. Based on lessons learned from past CWD management actions, the critical need is for states to set realistic CWD control objectives incorporating existing and prospective field data: and to apply any management action with sufficient spatial and temporal coverage to be effective (Miller and Fischer 2016). Early public engagement, before CWD is documented in Idaho, will be essential to build necessary public support for the management actions required to effectively contain and control CWD expansion in Idaho. Any attempt at controlling CWD will require decades of effort, time, and money to achieve results that can be sustained. Many management actions center on suppressing the CWD-affected population in an effort to contain further spread. Such actions are achieved by combinations of agency culling, hunter harvest, predator management, cessation of agency management practices (e.g., winter feeding and translocations), and in extreme cases, experimentation with controlled burning of contaminated environments. The development of models incorporating CWD prevalence analysis have allowed some agencies to estimate the amount of hunting pressure, predation, and CWD risk a population can withstand without threat of extinction (Dulberger et al. 2010, Galloway et al. 2017, Miller et al. 2008).